

D. Johnson  
#2 3-2700  
IDS w/refs  
File No.: 473P09US

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**Application No. : 09/465,396**  
**Filed : December 17, 1999**  
**Title : MICROPHONE ARRAY DIFFRACTING  
STRUCTURE**  
**Inventor : Michael R. Stinson et al**  
**Examiner :**  
**Group Art Unit : 2747**

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**INFORMATION DISCLOSURE STATEMENT**  
**Under 37 C.F.R. 1.97**

The Honourable Commissioner  
of Patents & Trademarks,  
WASHINGTON, D.C. 20231,  
U.S.A.

March 13, 2000

Sir:

Under the provisions of 37 C.F.R. 1.97, including particularly subsections (g) and (h) thereof, and 37 C.F.R. 1.98 including specifically subsection (d) thereof, Applicant calls to the attention of the Examiner the following documents, copies of which are enclosed:

AA	US	5 742 693	Elko	1998
AB	US	5 539 834	Bartlett et al	1996
AC	US	5 592 441	Kuhn	1997
AD	US	4 802 227	Elko et al	1989
AE	US	4 904 078	Gorike	1990

AN "Super directivity design for a sphere-buffed microphone array", J. Acoust. Soc. Am. Vol. 103, No. 5, 130, 2897, May 1998, K. Kawahara & K. Fukodome.

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- AO "A steerable and variable first-order differential microphone array", Intl. Conf. On Acoustics, Speech and Signal Processing, 1997, G. Elko and A. Pong.
- AP "A Method of Interpolating the Diffractive Information of the Sphere-Baffled Microphone in the Sound Field of Spherical Wave" Dept. Of Acoustic Design, Japan, K. Fukudome

These references were brought to the attention of the applicant. The relevance of these references are as follows:

U.S. Patent 5,742,693: Elko considers the improved directionality obtained by placing a first order microphone near a plane baffle, giving an effective second order system. Unfortunately, the system described is unwieldy. Elko notes that when choosing baffle dimensions, the largest possible baffle is most desirable. Also, to achieve a second order response, Elko notes that the baffle size should be in the order of at least one-half a wavelength of the desired signal. These requirements render Elko unsuitable for applications requiring physically small arrays.

U.S. Patent 5,539,834: Bartlett et al, discloses achieving a second order effect from a first order microphone. Bartlett achieves a performance enhancement by using a reflected signal from a plane baffle. However, Bartlett does not achieve the desired directivity required in some applications. While Bartlett would be useful as a microphone in a cellular telephone handset, it cannot be readily adapted for applications such as handsfree telephony or teleconferencing in which high directionality is desirable.

U.S. Patent 5,592,441: Kuhn uses forty-two transducers on the vertices of a regular geodesic two frequency icosahedron. While Kuhn may produce the desired directionality, it is clear that Kuhn is quite complex and impractical for the uses envisioned for the applicant's invention.

U.S. Patent 4,802,227: Elko et al, addresses the signal processing aspects of microphone arrays. Elko et al however, utilizes costly signal processing means to reduce noise. The signal processing capabilities required to keep adaptively calculating the required real-time analysis can be prohibitive.

U.S. Patent 4,904,078: Gorike, uses directional microphones in eyeglasses to assist persons with a hearing disability receiving aural signals. The directional microphones, however, do not allow for a changing directionality as to the source of the sound.

Kawahara and Fukudome: Kawahara and Fukudome suggests that a rigid sphere can be used to advantage in beamforming. However they do not have the features and advantages indicated in the applicant's invention.

Elko and Pong: Elko and Pong discuss a six-microphone configuration mounted on a sphere. They noted that the presence of the sphere acted to increase the effective separation of the microphones.

Fukudome: Fukudome provides more background information on baffled microphones.

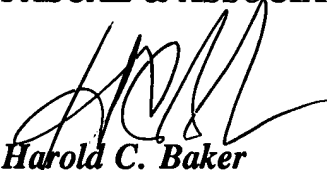
It should be noted that these three academic publications only consider the case of a rigid intervening sphere.

Applicant respectfully requests that these references be entered into the record of this application. The Examiner is requested to initial the appropriate area on the enclosed copy of PTO Form 1449, thereby indicating consideration by the Examiner of each of these references.

As this submission is being filed before the issuing of an office action, it is believed no fee is payable.

Applicant respectfully submits that the present claims are patentable over the references identified herein, and requests timely and favourable examination of this application.

*Respectfully submitted*  
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FORM PTO-1449  
(REV. 7-80)U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE

ATTY. DOCKET NO.

473P09US

SERIAL NO.

09/465,396

LIST OF REFERENCES CITED BY APPLICANT  
(Use several sheets if necessary)

APPLICANT Michael R. Stinson et al

FILING DATE

December 17, 1999

GROUP

2747

## U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF PERTINENT
	AA	5 742 693	Apr. 21/98	Elko			
	AB	5 539 834	Jul. 23/96	Bartlett et al			
	AC	5 592 441	Jan. 7/97	Kuhn			
	AD	4 802 227	Jan. 31/89	Elko et al			
	AE	4 904 078	Feb. 27/90	Gorike			
	AF						
	AG						
	AH						

## FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB CLASS	TRANSLATION	
							YES	NO
	AI							
	AJ							
	AK							
	AL							
	AM							

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)

	AN	"Super directivity design for a sphere-buffed microphone array" J. Acoust. Soc. Am., Vol. 103, No. 5, May 1998, Kawahara and Fukudome
	AO	"A steerable and variable first-order differential microphone array", Intl. Conf. On acoustics, Speech and Signal Processing, 1997, Elko and Pong
	AP	"A Method of Interpolating the Diffractive Information of the Sphere-Baffled Microphone in the Sound Field of Spherical Wave" Dept. Of Acoustic Design, Japan, Fukudome
	AQ	

EXAMINER

DATE CONSIDERED

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609: Draw line through reference and not search.